

IN THE CLAIMS

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1. (Original) A system for protecting a network comprising:
a plurality of links located in said network;
a transmitter switch, coupled to a first end of each link of said plurality of links,
for transmitting distinct data along each link of said plurality of links; and
a receiver switch, coupled to a second end of each link of said plurality of links,
for receiving said distinct data from each link of said plurality of links;
wherein said distinct data transmitted along one link of said plurality of links is
switched to another link of said plurality of links when a failure is detected on said one
link.
2. (Original) The system according to claim 1, wherein said network is an
Asynchronous Transfer Mode (ATM) network.
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3. (Original) The system according to claim 1, wherein said network is a
Frame Relay network.
4. (Original) The system according to claim 1, wherein said transmitter
switch further comprises a transmitter line card coupled to said first end of each link of
said plurality of links.
5. (Original) The system according to claim 4, wherein said distinct data
transmitted along each link of said plurality of links comprises cells.
6. (Original) The system according to claim 5, wherein said transmitter line
card further comprises a transmitter/classifier module for classifying said cells transmitted
along each link of said plurality of links, a plurality of transmitter queuing buffers
coupled to said classifier module, for receiving and storing said cells, and a transmitter
multiplexing module coupled to each buffer of said plurality of transmitter queuing

buffers and to each link of said plurality of links, for directing said cells stored in each buffer in a predetermined order to a corresponding link of said plurality of links.

7. (Original) The system according to claim 6, wherein said transmitter switch receives a virtual connection setup request and assigns at least one virtual connection corresponding to said virtual connection setup request alternatively to each buffer of said plurality of transmitter queuing buffers.

8. (Original) The system according to claim 7, wherein said at least one virtual connection is associated with said cells transmitted along each link of said plurality of links.

9. (Original) The system according to claim 7, wherein said transmitter switch assigns said at least one virtual connection to each buffer of said plurality of transmitter queuing buffers in such a way so as to ensure that each link has a balanced load.

10. (Original) The system according to claim 8, wherein said transmitter classifier module allocates said cells to each buffer of said plurality of transmitter queuing buffers based on association with said at least one virtual connection, in such a way so as to ensure that each link has a balanced load.

11. (Original) The system according to claim 6, wherein each buffer of said plurality of transmitter queuing buffers includes a plurality of Quality of Service (QoS) category queues.

12. (Original) The system according to claim 6, wherein said transmitter line card further comprises a transmitter processor for monitoring each link of said plurality of links and for programming said transmitter multiplexing module to switch said distinct cells transmitted along said one link of said plurality of links to said another link when said failure is detected on said one link.

13. (Original) The system according to claim 6, wherein said receiver switch further comprises a receiver line card coupled to said second end of each link of said plurality of links.

14. (Original) The system according to claim 13, wherein said receiver line card further comprises a receiver multiplexing module coupled to each link of said plurality of links, for merging said cells received on each link of said plurality of links and a receiver classifier module coupled to said receiver multiplexing module, for classifying and outputting said cells to a plurality of receiver queuing buffers.

15. (Original) The system according to claim 14, wherein said receiver line card further comprises a receiver processor for monitoring each link of said plurality of links and for instructing said transmitter processor of said failure of said one link.

16. (Original) The system according to claim 5, wherein each cell comprises a transmission header having a virtual circuit identifier (VCI).

17. (Original) The system according to claim 5, wherein each cell comprises a transmission header having a virtual path identifier (VPI).

18. (Original) The system according to claim 1, wherein each link of said plurality of links includes a total bandwidth and provides a guaranteed bandwidth to a user.

19. (Original) The system according to claim 18, wherein said total bandwidth of each link of said plurality of links is greater than a sum of said guaranteed bandwidth provided by any two links of said plurality of links.

20. (Original) The system according to claim 1, wherein said transmitter switch further comprises a plurality of transmitter line cards, each transmitter line card being coupled to said first end of a corresponding link of said plurality of links.

21. (Original) The system according to claim 20, wherein said distinct data transmitted along each link of said plurality of links comprises cells.

22. (Original) The system according to claim 21, wherein each transmitter line card of said plurality of transmitter line cards further comprises a transmitter classifier module for classifying said cells transmitted along each corresponding link, a plurality of transmitter queuing buffers coupled to said classifier module for receiving and storing said cells, and a transmitter multiplexing module coupled to each buffer of said plurality of queuing buffers and to said corresponding link of said plurality of links for directing said cells stored in one buffer of said plurality of queuing buffers to said corresponding link and said cells stored in all remaining buffers of said plurality of queuing buffers to a disposal bin.

23. (Original) The system according to claim 22, wherein said transmitter switch receives a virtual connection setup request and assigns at least one virtual connection corresponding to said virtual connection setup request alternatively to each buffer of said plurality of transmitter queuing buffers.

24. (Original) The system according to claim 23, wherein said at least one virtual connection is associated with said cells transmitted along each link of said plurality of links.

25. (Original) The system according to claim 23, wherein said transmitter switch assigns said at least one virtual connection to each buffer of said plurality of transmitter queuing buffers in such a way so as ensure that each link has a balanced load.

26. (Original) The system according to claim 24, wherein said transmitter classifier module allocates said cells to each buffer of said plurality of transmitter queuing buffers based on association with said at least one virtual connection, in such a way so as to ensure that each link has a balanced load.

27. (Original) The system according to claim 22, wherein each buffer of said plurality of transmitter queuing buffers includes a plurality of Quality of Service (QoS) category queues.

28. (Original) The system according to claim 22, wherein each of said transmitter line cards further comprises a transmitter processor for monitoring each link of said plurality of links and for programming said transmitter multiplexing module to switch said cells directed to said disposal bin to said corresponding link when said failure is detected.

29. (Original) The system according to claim 22, wherein said receiver switch further comprises a plurality of receiver line cards, each receiver line card being coupled to said second end of a corresponding link of said plurality of links.

30. (Original) The system according to claim 29, wherein each receiver line card of said plurality of receiver line cards further comprises a receiver multiplexing module coupled to said second end of said corresponding link of said plurality of links for receiving said cells, and a receiver classifier module coupled to said receiver multiplexing module for classifying and outputting said cells to a plurality of receiver queuing buffers.

31. (Original) The system according to claim 30, wherein each receiver line card of said plurality of receiver cards further comprises a receiver processor for monitoring said corresponding link, for detecting a failure of said corresponding link, and for instructing said transmitter processor corresponding to said link of said failure.

32. (Original) A method for protecting a network comprising:

providing a plurality of links between a transmitter switch and a receiver switch located within said network;

transmitting distinct data from said transmitter switch on each link of said plurality of links;

switching said distinct data transmitted along one link said plurality of links to another link of said plurality of links when a failure is detected on said one link; and receiving said distinct data to said receiver switch within said network.

33. (Original) The method according to claim 32, wherein said network is an Asynchronous Transfer Mode (ATM) network.

34. (Original) The method according to claim 32, wherein said network is a Frame Relay network.

35. (Original) The method according to claim 32, wherein said distinct data transmitted along each link of said plurality of links comprises cells.

36. (Original) The method according to claim 35, further comprising:
receiving a virtual connection setup request; and
assigning at least one virtual connection corresponding to said virtual connection setup request alternatively to each buffer of a plurality of transmitter queuing buffers in said transmitter switch.

37. (Original) The method according to claim 36, wherein said at least one virtual connection is associated with said cells transmitted along each link of said plurality of links.

38. (Original) The method according to claim 36, further comprising assigning said at least one virtual connection to each buffer of said plurality of transmitter queuing buffers in such a way so as to ensure that each link has a balanced load.

39. (Original) The method according to claim 37, further comprising:
classifying said cells within said transmitter switch;
storing said cells within said plurality of transmitter queuing buffers; and
directing said cells stored in each buffer of said plurality of transmitter queuing
buffers in a predetermined order to a corresponding link of said plurality of links.

40. (Original) The method according to claim 39, wherein, in said storing,
said cells are alternatively stored in each buffer of said plurality of transmitter queuing
buffers.

41. (Original) The method according to claim 39, further comprising, in said
storing, allocating said cells to each buffer of said plurality of transmitter queuing buffers
based on association with said at least one virtual connection, in such a way so as to
ensure that each link has a balanced load.

42. (Original) The method according to claim 35, further comprising
monitoring each link of said plurality of links for failure and programming a multiplexing
module to switch said plurality of cells directed to said one link of said plurality of links
to said another link when said failure is detected on said one link.

43. (Original) The method according to claim 35, further comprising:
merging said cells received on each link of said plurality of links;
classifying said cells; and
outputting said cells to a plurality of receiver queuing buffers.

44. (Original) The method according to claim 32, wherein each link of said
plurality of links includes a total bandwidth and provides a guaranteed bandwidth to a
user.

45. (Original) The method according to claim 44, wherein said total bandwidth of each link of said plurality of links is greater than a sum of said guaranteed bandwidth provided by any two links of said plurality of links.

46. (Original) A system for protecting a network, comprising:
a first link and a second link located in said network;
a transmitter switch, coupled to one end of said first link and said second link, for transmitting distinct data along said first link and said second link;
a receiver switch coupled to another end of said first link and said second link, for receiving said distinct data;
wherein said distinct data transmitted along said first link is switched to said second link when a failure is detected on said first link.

47. (Original) A method for protecting a network, comprising:
providing a first link and a second link between a transmitter switch and a receiver switch located in said network;
transmitting distinct data from said transmitter switch on said first link and said second link;
switching said distinct data transmitted along said first link to said second link when a failure is detected on said first link; and
receiving said distinct data to said receiver switch within said network.

48. (Original) A transmitter switch for protecting a network comprising:
at least one input line card for receiving data in said network; and
a transmitter line card coupled to said at least one input line card;
said transmitter line card coupled to each link of a plurality of links in said network;
said transmitter line card transmitting distinct cells of said data along each link of said plurality of links and switching said distinct cells transmitted along one link to another link when a failure is detected on said one link.

49. (Original) The transmitter switch according to claim 48, wherein said network is an Asynchronous Transfer Mode (ATM) network.

50. (Original) The transmitter switch according to claim 48, wherein said network is a Frame Relay network.

51. (Original) The transmitter switch according to claim 48, wherein said transmitter line card further comprises a transmitter classifier module for classifying said cells transmitted along said each link of said plurality of links, a plurality of transmitter queuing buffers coupled to said classifier module, for receiving and storing said cells, and a transmitter multiplexing module coupled to each buffer of said plurality of transmitter queuing buffers and to each link of said plurality of links for directing said cells stored in each buffer in a predetermined order to a corresponding link of said plurality of links.

52. (Original) The transmitter switch according to claim 51, wherein at least one virtual connection corresponding to a received virtual connection setup request is assigned alternatively to each buffer of said plurality of transmitter queuing buffers.

53. (Original) The transmitter switch according to claim 52, wherein said at least one virtual connection is associated with said cells transmitted along each link of said plurality of links.

54. (Original) The transmitter switch according to claim 52, wherein said at least one virtual connection is assigned to each buffer of said plurality of transmitter queuing buffers in such a way so as to ensure that each link has a balanced load.

55. (Original) The transmitter switch according to claim 53, wherein said transmitter classifier module allocates said cells to each buffer of said plurality of transmitter queuing buffers based on association with said at least one virtual connection, in such a way so as to ensure that each link has a balanced load.

56. (Original) The transmitter switch according to claim 51, wherein each buffer of said plurality of transmitter queuing buffers further includes a plurality of Quality of Service (QoS) category queues.

57. (Original) The transmitter switch according to claim 51, wherein said at least one transmitter line card further comprises a transmitter processor for monitoring each link of said plurality of links and for programming said transmitter multiplexing module to switch said distinct cells transmitted along said one link of said plurality of links to said another link when said failure is detected on said one link.

58. (Original) A transmitter switch for protecting a network comprising:
at least one input line card for receiving data in said network; and
a plurality of transmitter line cards coupled to said at least one input line card;
each transmitter line card being coupled to a corresponding link of a plurality of links in said network;
each transmitter line card transmitting distinct cells of said data along each link of said plurality of links and switching said distinct cells transmitted along one link to another link when a failure is detected on said one link.

59. (Original) The transmitter switch according to claim 58, wherein said network is an Asynchronous Transfer Mode (ATM) network.

60. (Original) The transmitter switch according to claim 58, wherein said network is a Frame Relay network.

61. (Original) The transmitter switch according to claim 58, wherein each transmitter line card of said plurality of transmitter line cards further comprises a transmitter classifier module for classifying said cells transmitted along said corresponding link of said plurality of links, a plurality of transmitter queuing buffers coupled to said classifier module, for receiving and storing said cells, and a transmitter multiplexing module coupled to each buffer of said plurality of transmitter queuing

buffers and to said corresponding link of said plurality of links for directing said cells stored in one buffer of said plurality of queuing buffers to said corresponding link and said cells stored in all remaining buffers to a disposal bin.

62. (Original) The transmitter switch according to claim 61, wherein at least one virtual connection corresponding to a received virtual connection setup request is assigned alternatively to each buffer of said plurality of transmitter queuing buffers.

63. (Original) The transmitter switch according to claim 62, wherein said at least one virtual connection is associated with said cells transmitted along each link of said plurality of links.

64. (Original) The transmitter switch according to claim 62, wherein said at least one virtual connection is assigned to each buffer of said plurality of transmitter queuing buffers in such a way so as to ensure that each link has a balanced load.

65. (Original) The transmitter switch according to claim 63, wherein said transmitter classifier module allocates said cells to each buffer of said plurality of transmitter queuing buffers based on association with said at least one virtual connection, in such a way so as to ensure that each link has a balanced load.

66. (Original) The transmitter switch according to claim 61, wherein each buffer of said plurality of transmitter queuing buffers further includes a plurality of Quality of Service (QoS) category queues.

67. (Original) The transmitter switch according to claim 61, wherein each transmitter line card further comprises a transmitter processor for monitoring each link of said plurality of links and for programming said transmitter multiplexing module to switch said cells directed to said disposal bin to said corresponding link when said failure is detected.

68. (Original) A method for protecting a network comprising:
receiving data in said network;
transmitting distinct cells of said data along each link of a plurality of links in said network; and

switching said distinct cells transmitted along one link to another link when a failure is detected on said one link.

69. (Original) The method according to claim 68, wherein said network is an Asynchronous Transfer Mode (ATM) network.

70. (Original) The method according to claim 68, wherein said network is a Frame Relay network.

71. (Original) The method according to claim 68, further comprising:
receiving a virtual connection setup request; and
assigning at least one virtual connection corresponding to said virtual connection setup request alternatively to each buffer of a plurality of transmitter queuing buffers.

72. (Original) The method according to claim 71, wherein said at least one virtual connection is associated to said cells transmitted along each link of said plurality of links.

73. (Original) The method according to claim 71, further comprising
assigning said at least one virtual connection to each buffer of said plurality of transmitter queuing buffers in such a way so as to ensure that each link has a balanced load.

74. (Original) The method according to claim 72, further comprising:
classifying said cells;
storing said cells within each buffer of said plurality of transmitter queuing buffers; and

directing said cells stored in said each buffer in a predetermined order to a corresponding link of said plurality of links.

75. (Original) The method according to claim 74, wherein, in said storing, said cells are alternatively stored within said each buffer.

76. (Original) The method according to claim 74, further comprising, in said storing, allocating said cells to said each buffer based on association with said at least one virtual connection, in such a way so as to ensure that said link has a balanced load.

77. (Original) The method according to claim 68, further comprising monitoring each link for failure and programming a multiplexing module to switch said cells directed to said one link to said another link when said failure is detected on said one link.

78. (New) An apparatus, comprising:
means for receiving data in a network;
means for transmitting distinct cells of said data along each link of a plurality of links in said network; and
means for switching said distinct cells transmitted along one link to another link when a failure is detected on said one link.

79. (New) The apparatus of claim 78, further comprising:
means for receiving a virtual connection setup request; and
means for assigning at least one virtual connection corresponding to said virtual connection setup request alternatively to each buffer of a plurality of transmitter queuing buffers.

80. (New) The apparatus of claim 79, further comprising means for assigning said at least one virtual connection to each buffer of said plurality of transmitter queuing buffers in such a way so as to ensure that each link has a balanced load.

81. (New) The apparatus of claim 79, wherein said at least one virtual connection is associated to said cells transmitted along each link of said plurality of links, and wherein the apparatus further comprises:

means for classifying said cells;

means for storing said cells within each buffer of said plurality of transmitter queuing buffers; and

means for directing said cells stored in said each buffer in a predetermined order to a corresponding link of said plurality of links.